



Multi-Wavelength Identification of Extremely Young Galaxies with CANDELS

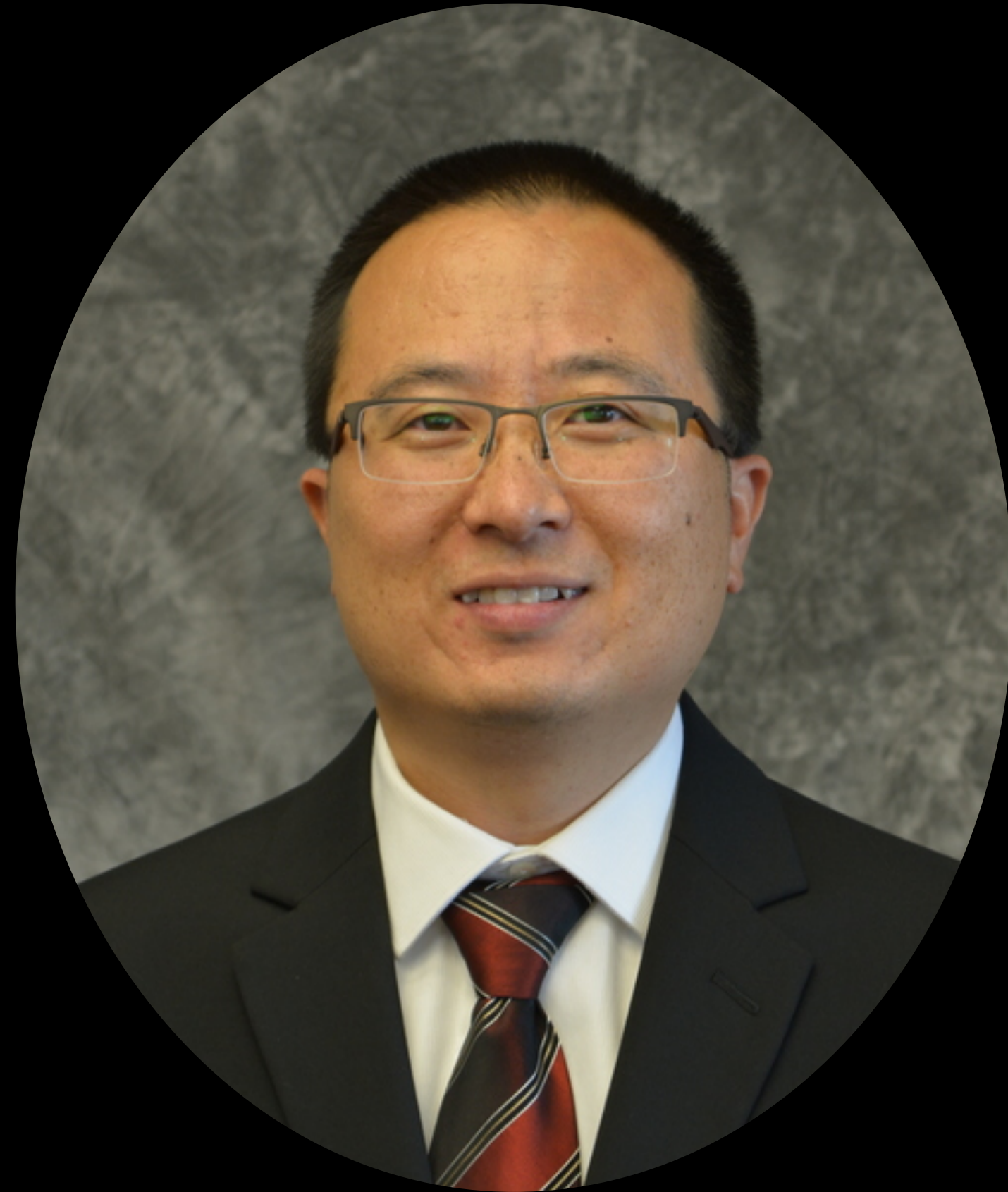


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Undergraduate Research & Creative Achievements Forum

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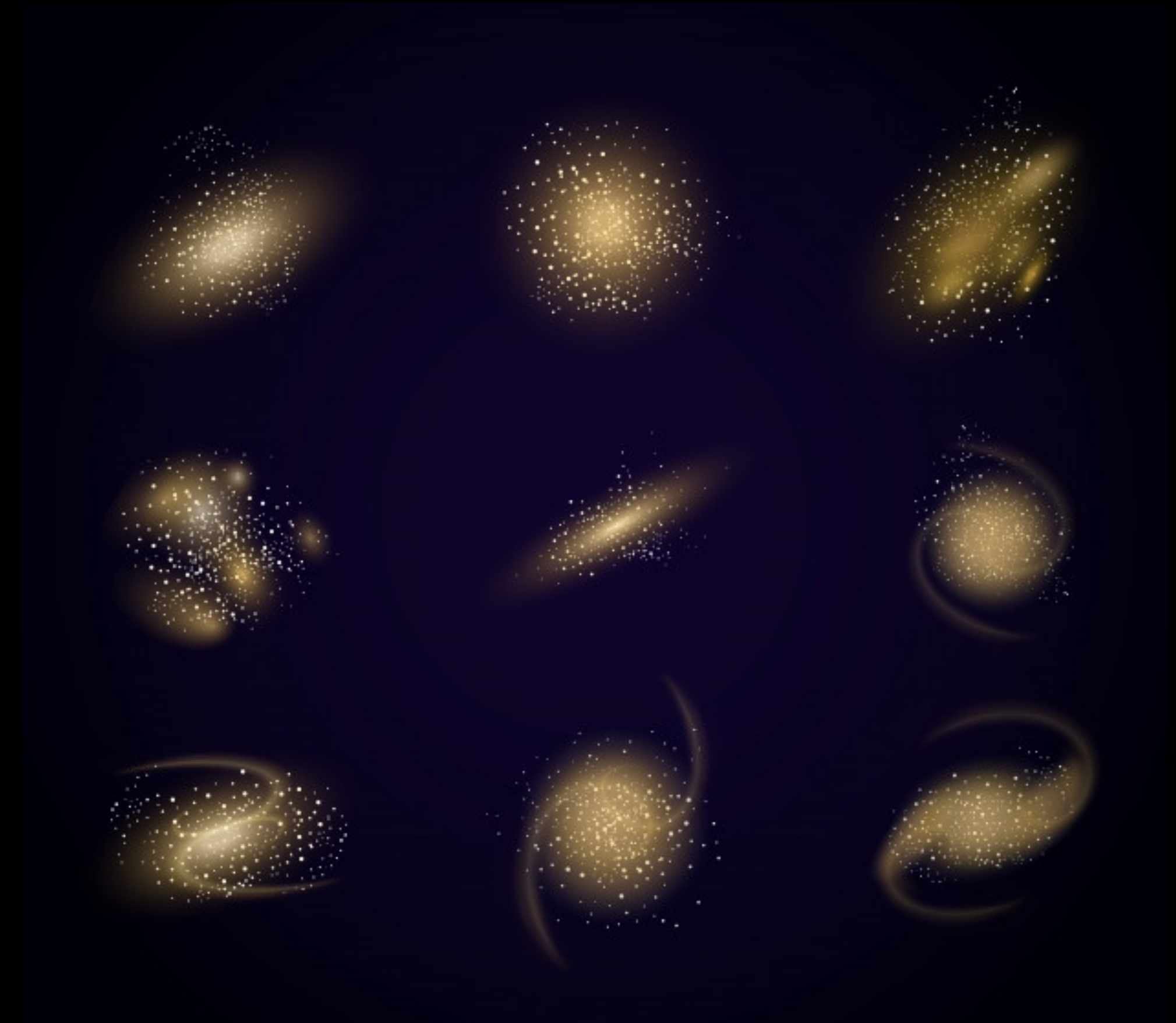


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- What controls the mass--energy--chemical cycles in galaxies
- Connection between morphology, color, and physical properties of galaxies
- How star formation activity is turned on and off in galaxies

3 Big Questions

How does the Universe Work?

Understanding the origins and fate of the universe are the first steps to revealing the mechanisms on how it works

How did we get here?

Studying the formation of galaxies, planets, and other astronomical phenomena to understand how the Universe has evolved

Are we alone?

The search for habitable planets along with searching for possibility of life that isn't just similar to our own

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- Understanding the formation and evolution of young galaxies in the early universe can help reveal clues on how large galaxies (like our Milky Way) were formed and evolved.
- We study the physical properties such as (stellar mass, number density, shape) of distant extremely young galaxies.

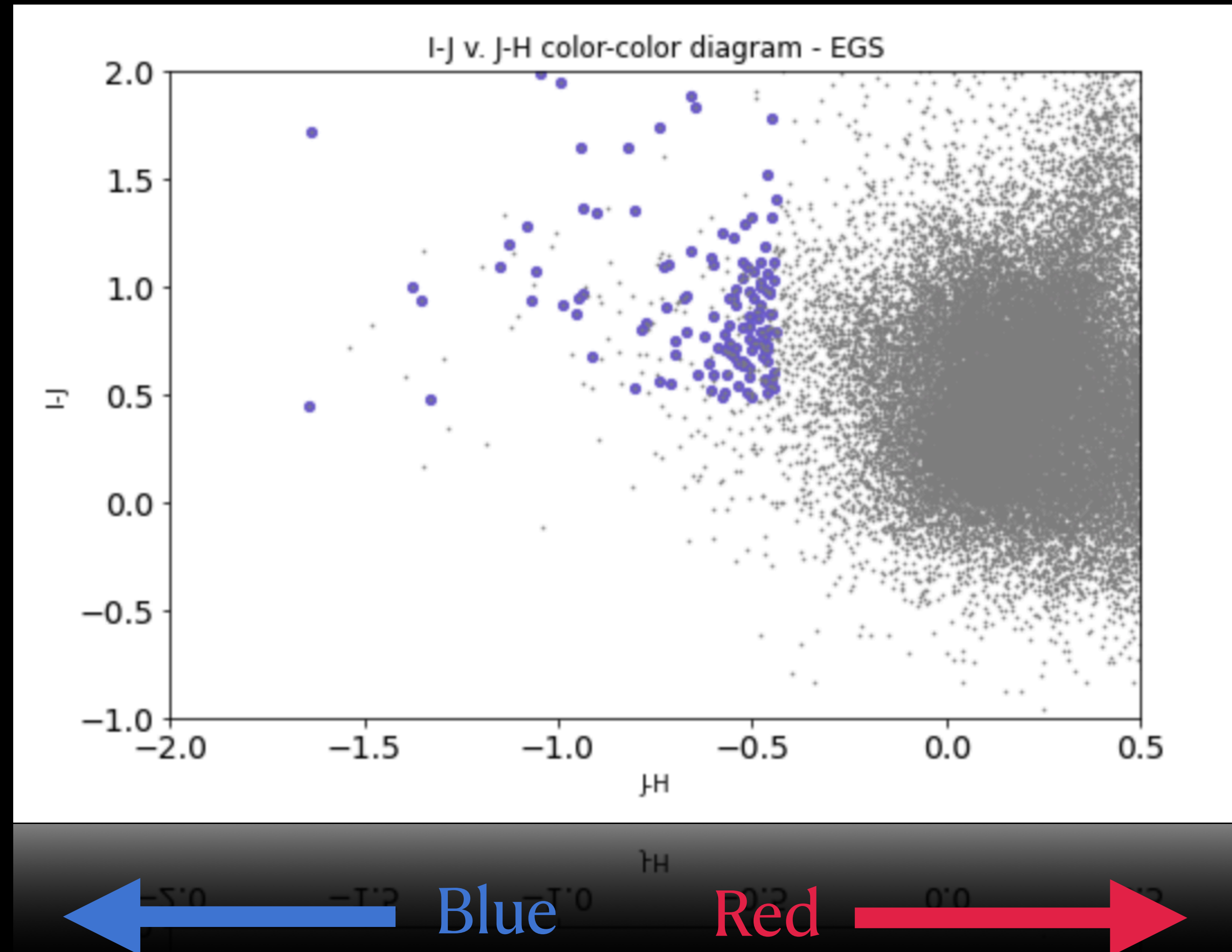


Methods

- Using data from Cosmic Assembly Near-infrared Deep Extragalactic Legacy Survey (CANDELS)
- Used specific criteria to select 311 candidates spread across 4 CANDELS sky-regions
- Used flux-ratio (ratio of brightness between 2 passbands) or “color” to specify blue (hotter) and red (cooler) galaxies

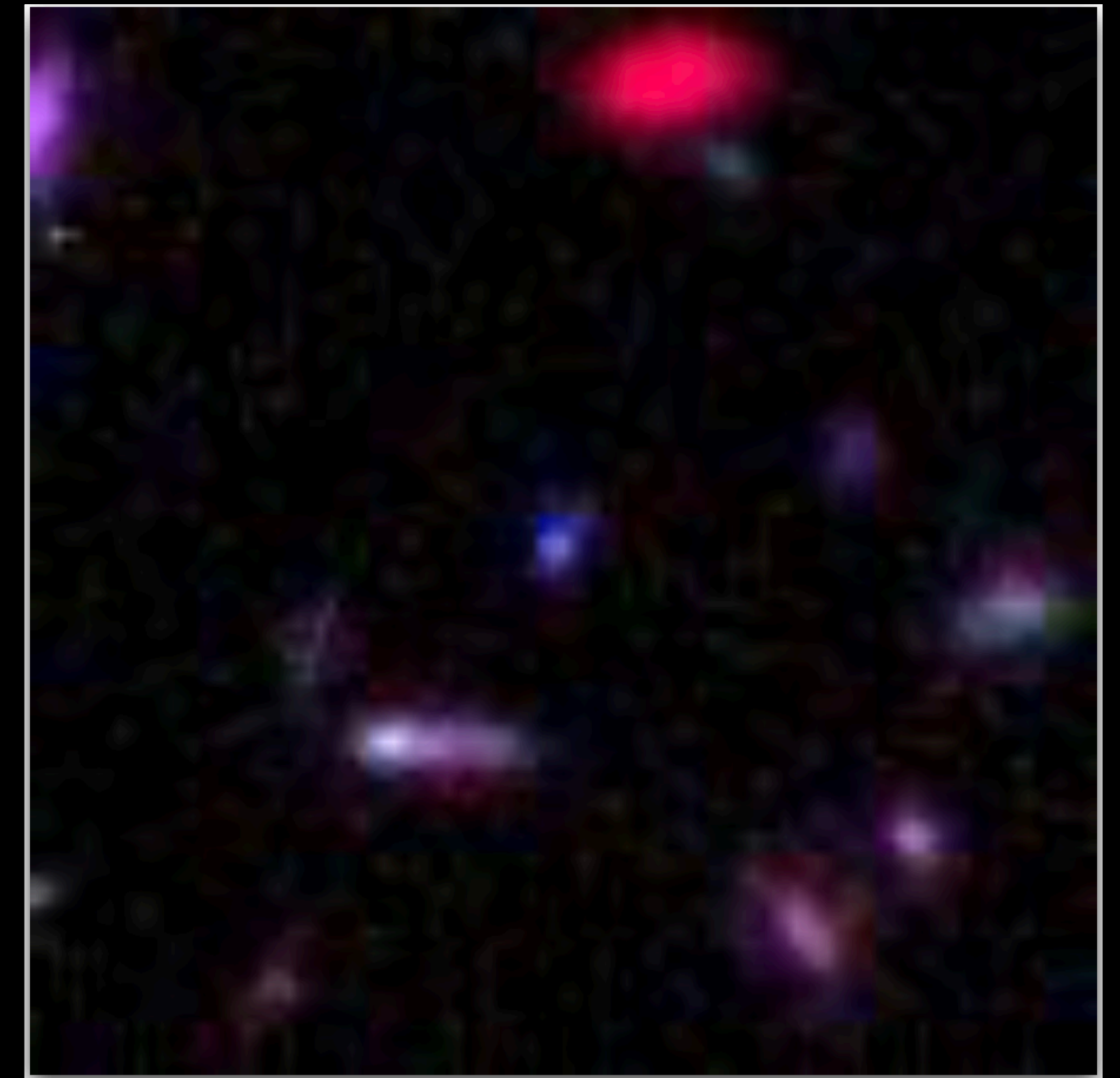
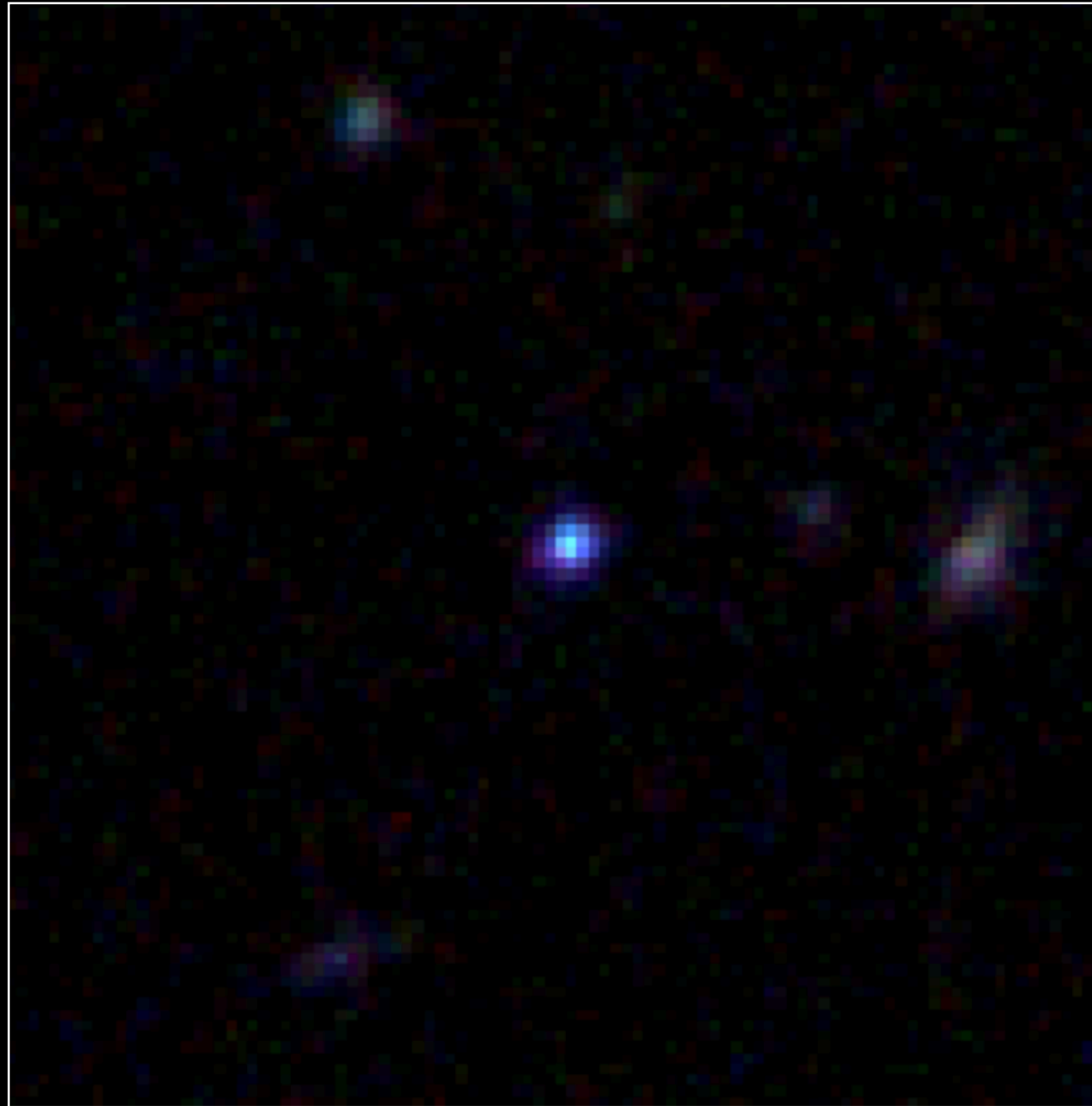


Data



- Example 1 out of 4 different fields
- Galaxies selected (*purple dots*) were much more blue than the majority (*grey dots*)
 - These bluer candidates tell us that there's extreme star formation activity

Results

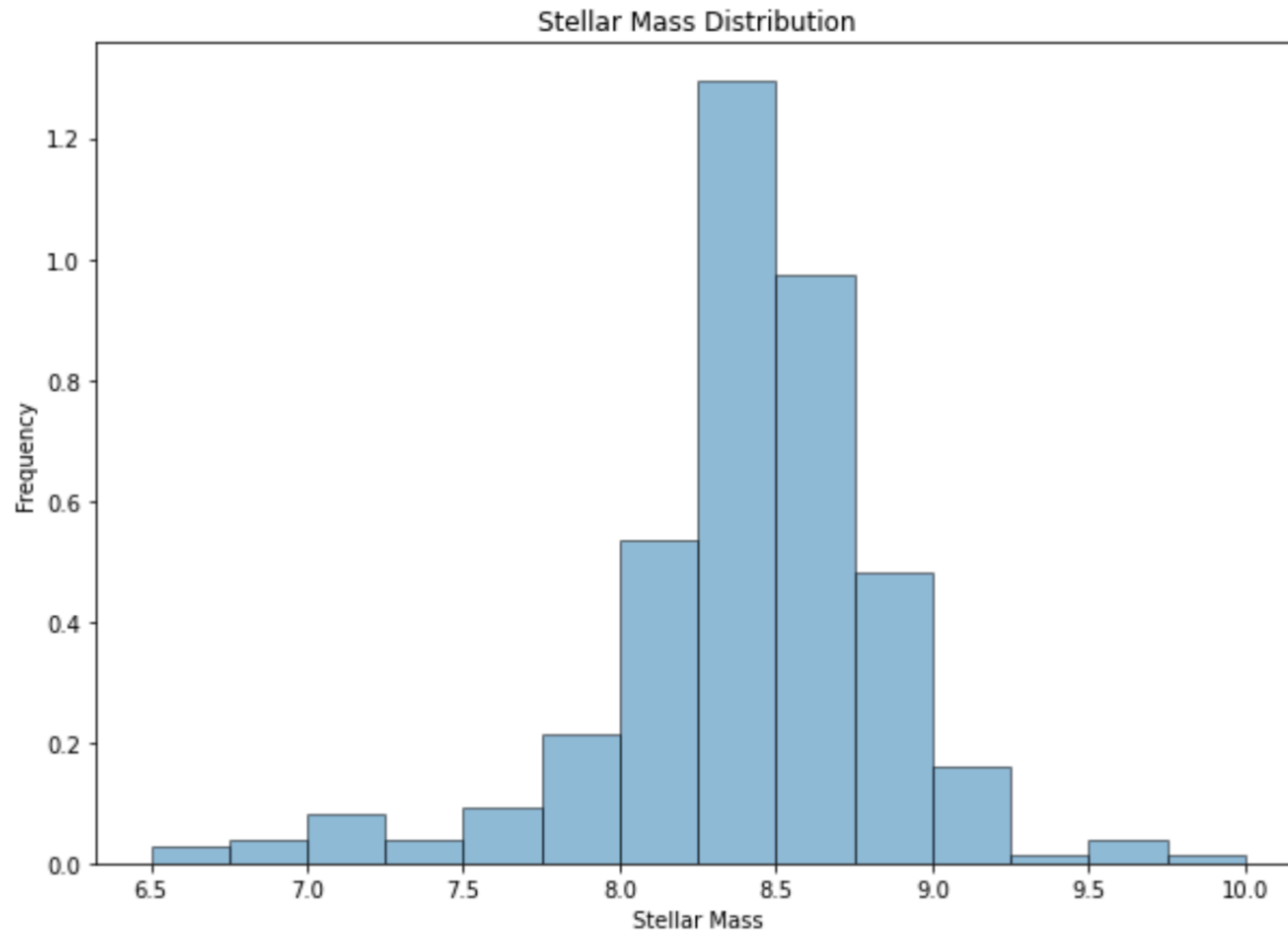


Manually made images for all 311 galaxies to show their morphologies

3 different candidates are shown all in the center (blue dot)

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Stellar Mass Distribution for the 311 candidates



- 100 million - 1 billion times larger than the mass of our sun
- These are 100x smaller than our Milky Way, more proof that our selection method works

Conclusions & Implications

- Successfully used color (flux ratio) to select many young and blue galaxies
- The stellar masses of the 311 galaxies are approximately 100 times SMALLER than our own Milky Way
- Showed that our color selection method is an efficient and accurate way to select young galaxies

Next Steps

We conclude our method works properly to select very young galaxies which could be progenitors of galaxies like our own Milky Way

- Incorporate various spectroscopic techniques for further analysis into other significant physical properties
 - Size
 - Shape
 - Chemical Abundance
 - Star Formation Rate

Personal Experience & Acknowledgments

Special thank you to Dr. Guo!!!



- Research experiences at University of Colorado - Boulder and American Museum of Natural History
- Discovered love for research and teaching
- Applying to graduate school for a Ph.D in Astrophysics